Instrument Incubator

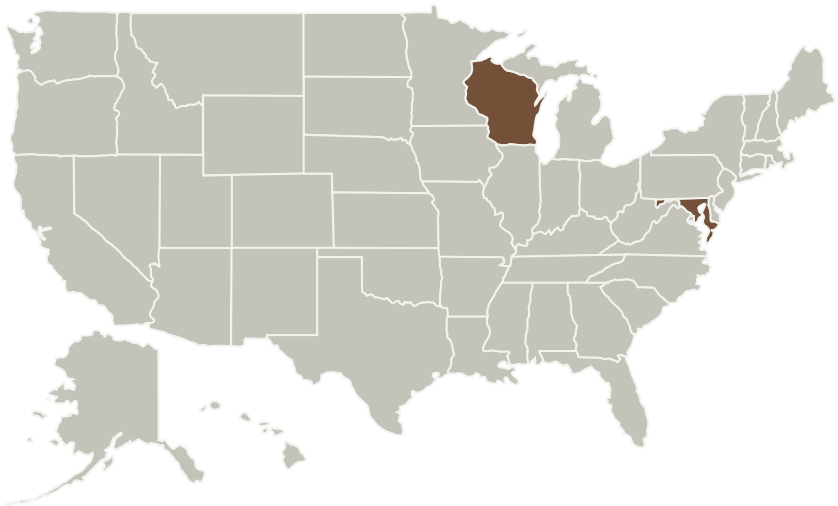
Compact Midwave Imaging System

Completed Technology Project (2017 - 2020)

Project Introduction

We propose to develop a next-generation satellite instrument called the Compact Midwave Imaging Sensor (CMIS), which avoids the need for large, expensive cryogenic cooling and thus permits deployment on small satellites for multiple mission applications including imaging of cloud properties, brightness temperature, cloud optical depth, and cloud fraction as well as characterizing mid-IR thermal emission from forest fires and volcanic eruptions. In this development effort, we focus on the application for measuring cloud properties. Long-term measurements of the global distribution of clouds are needed to provide inputs to climatological models for global change studies. Instruments that rely on the atmospheric window in the midwave infrared (MWIR; 3-5 μm) offer utility not only for cloud remote sensing, but also for cloud-snow discrimination. Until recently, only cryogenically cooled detector technologies such as InSb and HgCdTe were available for MWIR sensing. Because of the reliance of these technologies on closed-cycle coolers, heritage MWIR sensors tend to fly on large spacecraft due to their large size, weight, and power (SWaP). The Johns Hopkins University Applied Physics Laboratory (APL) proposes an Instrument Development and Demonstration (IIP-IDD) project to increase the technical readiness of CMIS. The low-cost, small-SWaP CMIS solution is based on the use of thermoelectrically cooled sensor that leverages newly available, low noise lead salt (PbSe) array detector technology. Lab measurements have demonstrated NEdT = 0.03K for the optimum detector operating temperature of 230 K. The objective of the proposed project is to design and develop a spaceflight prototype unit, test, characterize and calibrate the unit, and conduct an airborne campaign to demonstrate its capabilities.

Primary U.S. Work Locations and Key Partners



Compact Midwave Imaging System

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

Johns Hopkins University Applied Physics Laboratory (JHU/APL)

Responsible Program:

Instrument Incubator

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Organizations Performing Work	Role	Type	Location
Johns Hopkins University Applied Physics Laboratory(JHU/APL)	Lead Organization	R&D Center	Laurel, Maryland

Primary U.S. Work Locations	
Maryland	Wisconsin

Project Management

Program Director:

Pamela S Millar

Program Manager:

Parminder S Ghuman

Principal Investigator:

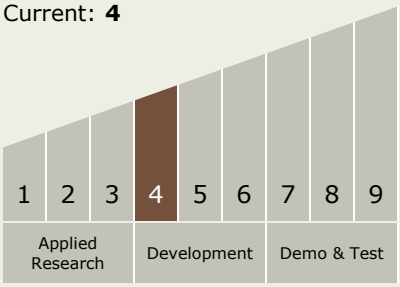
Michael A Kelly

Co-Investigators:

Arnold C Goldberg
Felicia Hastings
John D Boldt
Andrew K Heidinger
Charles A Hibbitts
Jeng-hwa Yee
Dongliang Wu

Technology Maturity (TRL)

Start: **4**
Current: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors

Continued on following page.

Technology Areas *(cont.)*

- TX08.1.1 Detectors and Focal Planes

Target Destination

Earth